National Science Foundation
and the
National Nanotechnology Initiative present

Generation Nano: Small Science, Superheroes

Participants' Guide

DESCRIPTION

In Brief:

You are invited to compete in "Generation Nano: Small Science, Superheroes," a competition that asks individual high-school students to submit an original idea for a superhero, who uses unique nanotechnology inspired gear. Students will submit a short written entry, as well as a short video or comic strip, that illustrates their superhero's nanotechnology-enabled gear. Winners will receive cash prizes and the opportunity to showcase their creation at the 2016 USA Science & Engineering Festival in Washington, D.C.

The idea of the superhero armed with their fantastical powers has served to mesmerize the world for nearly a century. The ability to fly, cling to walls with bare hands, and see with X-ray vision is popularly interpreted as a supposition based on no solid foundation. Often, superhero abilities appear magical rather than being grounded in science and technology. As we make advances in nanotechnology and materials research, we're discovering that superhero powers may not be that farfetched. Through nanotechnology applications like targeted drugs, self-assembled nanodevices, molecular motors, graphene in electrical supercapacitors and artificial red blood cells, we may not have to wait until that fateful day we're bitten by a radioactive spider in order to become superhuman!

The National Science Foundation (NSF) and the National Nanotechnology Initiative (NNI) are excited to introduce "Generation Nano: Small Science, Superheroes"! The competition asks high-school students to design a costume, gadget, vehicle or other gear for an original superhero that uses technology extrapolated from current nanotechnology research. The competition will help students learn about the potential and limitations of real-world nanotechnology. Students will submit a written entry explaining their superhero and how they have incorporated nanotechnology research into their gear, as well as either a short comic strip or video introducing the superhero.

Who: High-school students, individuals.

What: A **written entry** explaining the superhero and nanotechnology-driven gear, with particular emphasis on the research behind the nanotechnology; and a **90-second video OR 1 page comic strip** introducing the superhero and the student's nanotechnology-enabled gear.

When: Competition opens Late **November, 2015**; submissions due by **midnight, February 2, 2016, Eastern Standard Time.** Finalist round presentation and judging occurs **April 16-17, 2016** in Washington, D.C at the 2016 USA Science & Engineering Festival.

Where: The competition's online platform, **nsf.gov/GenNano**, where you can learn more about the challenge, access resources, register and submit your written entry and comic strip **or** 90-second video. Finalist round competitors' attendance and presentation is required at the USA Science & Engineering Festival in Washington, D.C April 16-17, 2016.

Why: To promote early interest in science, technology, engineering and mathematics (STEM) and nanotechnology.

ELIGIBILITY CRITERIA

- All entries must be received during the competition submission window:
- Each submission must be made by an individual.
- All students must be enrolled in a high-school or home schooled in the U.S., its territories or possessions at the time of entry (e.g., the fall 2015 semester or the spring 2016 semester), and be in good standing.
- Students are limited to participating in one project for this challenge.
- Students must be U.S. citizens, nationals or permanent residents.
- Each entrant certifies, through submission to the contest, that the entry is his or her own original creative work and does not violate or infringe the creative work of others, as protected under U.S. copyright law.
- Each entrant must submit a Parental/Guardian Permission Form and Photo Consent Form, available on the competition platform.

ENTRY GUIDELINES

A complete entry consists of two components, a written entry and a comic strip or video entry, described below. Entrants should review the entry form on the online platform for more details about the submission requirements and process. Entrants must register through the online platform.

A successful entry will be original, creative and visually appealing. No gratuitous violence or other inappropriate content will be permitted.

Written Entry

The written entry will be submitted on the challenge platform in the four sections detailed below. Each section has a 1,600-character limit including spaces (about 250 words).

- **The Superhero:** Name your superhero. Who are they and what is their story? Clearly and succinctly describe the main attributes of your hero and provide any necessary background information about them, including abilities, accessories and strengths and weaknesses.
- **The Accessory/Gear:** Describe your superhero's nanotechnology-enabled accessory or gear. Is it a vehicle, costume, weapon, or something else? Make sure the description focuses on the attributes of the gear: What can it do and why? How does it help the superhero?
- **The Technology:** Describe how your gear incorporates nanotechnology. Give a background of the research behind your chosen technology. How does current research make your gear possible? What further advances are needed to make the gear a reality? This section does not need to be overly technical, but you should include at least two references to current nanotechnology research either in the form of news articles or scholarly journal articles (not Wikipedia), to support your explanation of the technology. The technology doesn't have to be currently possible, but there must be research to support that it may be in the future. Extra space will be given for references.
- **The Repercussions:** Describe one unintended societal consequence of the technology if it gets in the wrong hands or is used irresponsibly (for example, like the consequences of invisibility cloaks explored in this video). How could society help mitigate the risks of this consequence?

Comic Strip Entry

The comic strip entry will be submitted on the online competition platform and should be no longer than one page. The comic strip should:

- Clearly introduce the superhero and gear and tell a story. The comic strip should have a unified voice, vitality and energy, and should emphasize how the accessory is useful in overcoming the story's conflict. It should also give insights not provided in the written entry to create a novel presentation. A successful entry will be visually striking and edited to a high standard. The comic strip should also deliver clear and understandable messages using non-technical language.
- Be composed either by hand or using a digital comic strip generator or drawing program.
- Not include any copyrighted imagery or items (resources for non-copyrighted images below).
- Be a JPEG file type.
- Provide a short caption to be displayed with the comic strip if chosen for presentation.

Video Entry

The video entry will be submitted on the online competition platform and should consist of a single video, no longer than 90-seconds.

- The video should clearly introduce the superhero and gear and articulate a story. The video should have a unified voice, vitality and energy, and should emphasize how the gear is useful in overcoming the story's conflict. It should also give insights not provided in the written entry to create a novel presentation. A successful entry will be visually striking and edited to a high standard. The video should also deliver clear and understandable messages using non-technical language.
- Videos do not have to include credits, but if they do, these will be included in the 90-second time limit.
- Entrants must upload video submissions to YouTube and provide a link to the video on the entry form.
- Provide a short caption to be displayed with the video if chosen for presentation.

Resources Available for the Written Entry, Video and Comic strip

Students may choose to utilize the following resources for nanotechnology research and comic strip generation (but are not limited to these resources).

Nanotechnology Resources:

- National Nanotechnology Initiative http://www.nano.gov/
    - Basics of Nanotechnology http://www.nano.gov/nanotech-101#content
    - Nanotechnology and You http://www.nano.gov/you#content
- Wired article about graphene and Iron Man: http://apngenterprises.com/?page_id=2
- MIT's Institute for Soldier Nanotechnology: http://isnweb.mit.edu/
- Current available nanotechnology products: http://www.nanotechproject.org/cpi/
- Nanotechnology in textiles: http://www.nano-tex.com/
- Article on nanotechnology's potential: http://io9.com/how-medical-nanotech-will-change-humanity-forever-1476398307
- "What is Nanotechnology" Video: https://www.youtube.com/watch?v=9PRSzkqFLEs&list=PL556DA4E9D467F799
- NISE Net's website: http://whatisnano.org/

Comic strip Generation:

- Pixton http://www.pixton.com/
- Toon Doo http://www.toondoo.com/
- Bit Strips https://www.bitstrips.com/create/comic/
- Chogger http://chogger.com/
- Marvel http://marvel.com/games/play/34/create_your_own_comic

Free, Non-copyrighted Image Sources:

- Freerange Stock: http://freerangestock.com/
- MorgueFile: http://morguefile.com/
- Wikimedia Commons: http://commons.wikimedia.org/wiki/Main_Page

Free, Non-copyrighted Audio Sources:

- Freesound: https://www.freesound.org/browse/
- MusOpen: https://musopen.org/music/
- Jamendo: https://www.jamendo.com/en?p=tags
- Sound Bible: http://soundbible.com/

THE PROCESS AND PRIZES

1. All entries will first be screened for compliance with the rules.
2. Each entry will be anonymously evaluated based on the stated criteria (see rubric for additional information) and will be scored on a sliding scale by each judge. Judges will score the entries in three categories for a total of 100 points: Creativity (25 percent), Use of Nanotechnology (50 percent), Artistic and Technical Quality (25 percent). The scores will then be combined for a total possible score of 100 points.
3. The panel of preliminary round and second round judges will consist of judges with expertise in nanotechnology and/or graphic design.
4. The 10 highest scoring entries from the preliminary round will become semifinalists. Each semifinalist's comic strip or video will be posted on the competition website for public viewing. After the semifinalists have been chosen, a second round of judging will take place to determine the finalists.
5. The three highest scoring entries will become finalists. NSF reserves the right to adjust the ratios of finalists based on the number and quality of submissions. The finalists' videos and comics will be posted on the competition website for public viewing.
6. Finalists will be invited to attend and present their entry at the 2016 USA Science & Engineering Festival in Washington, D.C. (April 16-17, 2016), a two-day STEM expo aimed at advancing STEM education and inspiring the next generation of scientists and engineers. The biannual, award winning USA Science & Engineering Festival is the largest festival of its kind, and the only national science festival. The Festival features speeches from inspirational scientists, exhibits from some of the biggest names in STEM, and interactive and informative demonstrations.
7. A separate panel of judges will evaluate all finalist entries based on the same judging criteria used in the first two rounds, combined with an evaluation of the presentation given at the 2016 USA Science & Engineering Festival. From the three finalists, a winner, second and third place individual will be chosen using both the judges' scores and public input. This panel of judges will also consist of experts in nanotechnology and/or graphic design.
8. At the Festival, finalists will showcase their comic strip or video. Some details about the 2016 USA Science & Engineering Festival are below – more detailed instructions will be provided to finalist individuals:

- Students and their designated chaperone (one per student) will have all travel, room and board costs associated with attending the 2016 USA Science & Engineering Festival paid on their behalf.
- Four weeks before attending the 2016 USA Science & Engineering Festival, finalists will receive detailed instructions on how to prepare for the festival.
- At the festival, finalists will give a short presentation about their superhero and nanotechnology-enabled accessory to a panel of judges and a public audience. Judges will award final prizes based on a combination of the essay and video or comic strip score, as well as on the quality of the final presentation. The public audience will also rank the finalists, and this ranking will be combined with the judges' scores to determine the winners. More information about the content requirements of the presentation will be available to the finalists once they are chosen.

9. 1st place prize will be $1500, 2nd place $1000, and 3rd place $500.

JUDGING ROUNDS

Preliminary Judging Round February 5-17, 2016

10 Semifinalists are announced ***February 22, 2016***

Finalist Determination Judging Round February 25- March 10, 2016

3 Finalists are announced ***March 15, 2015***

Finalist presentations at USA Science & Engineering Festival in Washington, D.C

1st, 2nd, and 3rd place winners announced ***April 16 -17, 2016***

JUDGING CRITERIA

Judges will assess and weigh the following criteria when scoring the entries in addition to the criteria set forth in the rubric:

1. Creativity: The originality and quality of both the superhero and his or her story as well as the application of Nanotechnology through the accessory: 25 percent
2. Use of Nanotechnology: How accurately the entrant incorporated nanotechnology into their story, possible negative uses or unintended societal consequences of the technology, as well as ways to mitigate those risks: 50 percent
3. Artistic and Technical Quality: The visual appeal and refined execution of each entrant's comic strip or video: 25 percent

SUMMARY OF RULES

- A competition entry constitutes an agreement to adhere to the rules and stipulations set forth by the contest sponsors.

- Any entrant or entry found in violation of any rule will be disqualified.
- Each entrant certifies, through submission to the contest, that the entry is their own original creative work and does not violate or infringe the creative work of others, as protected under U.S. copyright law or patent law.
- By entering the contest, the entrant agrees to hold harmless, NSF for all legal and administrative claims to include associated expenses that may arise from any claims related to their submission or its use.
- All judges' decisions are final and may not be appealed.
- Entrants retain all copyright and equivalent rights but give NSF nonexclusive rights to use their names, likenesses, quotes, submissions or any part of the submissions for educational publicity and/or promotional purposes. These include, but are not limited to, website display, print materials and exhibits.
- NSF will not be responsible for any claims or complaints from third parties about any disputes of ownership regarding the ideas, solutions, images or video.
- Winners and their parents or guardians are responsible for all taxes or other fees connected with the prize received and/or travel paid for by the sponsoring organization.
- Employees, contractors, officers or judges of the sponsoring organizations and their children are not eligible to enter the competition.
- NSF reserves the right to modify or cancel the competition at any time during the duration of the competition for any reason, including but not limited to an insufficient number of qualified entries received.
- Should NSF decide to bring winning contestants to Washington, D.C., or to any other location for promotional and other purposes, expenses paid by NSF will be within the limits set forth in law according to federal travel regulations.
- All contestants agree that they, their heirs and estates shall hold harmless the United States, the employees of the federal government, and all employees of NSF for any and all injuries and/or claims arising from participation in this contest, to include that which may occur while traveling to or participating in contest activities.
- All contestants must submit a Parental/Guardian Permission Form and Photo Consent Form, available on the competition platform.
- All finalists must be accompanied by a parent /guardian or chaperon to the 2016 USA Science & Engineering Festival in Washington, D.C.
- NSF has the final say on any point not outlined in the entry rules.